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(54) MANUFACTURE OF POLYIMIDE FLEXIBLE PRINTING CIRCUIT AND COVER LAY FILM

(57)Abstract:

PROBLEM TO BE SOLVED: To improve the dimensional accuracy at the time of manufacturing a flexible print printing circuit base or a cover lay film by reducing the unevenness of the dimensional change rate generated by the moisture absorption of a polyimide film and the dimension change rate between lots.

SOLUTION: A polyimide film is heated continuously and dried by infrared rays or an infrared ray heater continuously in a line to reduce the water content of the film to 0.1% or less, and a thermosetting bonding agent is applied on one face of the film, on which a metal foil is laminated, and the dimensional change rate of a film-metal foil laminate is set within ±0.05% both in the longitudinal direction and the width direction in the state of removing the metal foil on the laminate based on the measured value after the heat treatment under the condition of 150°C×30 minutes.

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[JP,10-235784,A]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] the thing about the manufacture approach of the substrate for polyimide system flexible printed circuits with good dimensional stability that this invention is used for a printed circuit etc., and the manufacture approach of the cover-lay film used for a flexible printing substrate -- it is -- fine one -- it is used suitable for a pattern flexible printed circuit board.
[0002]
[Description of the Prior Art] In recent years, with lightweight-izing of an electronics product, a miniaturization, thinning, and advanced features, the need of a printed circuit board increases, the use range spreads and, as for the flexible printed circuit board, the need is extended increasingly especially. Recently, advanced features of a printed circuit board and fine patternizing progress, and a large-sized object also increases, the dimensional stability is demanded increasingly, and high performance-ization is similarly required for the dimensional stability of the cover-lay film for protection of a flexible printed circuit. Conventionally, hygroscopicity of the polyimide film was large, since it elongated according to moisture absorption, the dimensional stability of a laminate with a metallic foil worsened, it could not hold dimensional accuracy at the time of printed circuit production, but fine patternizing and manufacture of a large-sized printed circuit board were difficult for it. Moreover, lot-to-lot dispersion of the rate of a dimensional change of the flexible substrate which dispersion in the rate of a dimensional change also has in lot-to-lot [of a polyimide film], and was manufactured according to laminating conditions etc. also tends to become large. Therefore, even if it expected the rate of a dimensional change of a substrate beforehand by the circuit design stage, there were many problems -- the yield of a substrate will fall. Similarly, in the cover-lay film, because of hygroscopic degradation of a polyimide film, the dimensional stability of a cover-lay film worsened and dimensional accuracy at the time of printed circuit production was not able to be held. Conventionally, according to JP,2-134241,A, the approach of preparing desiccation down stream processing of a film as a head end process, carrying out coating of the adhesives, after drying within a drier (oven) beforehand for several hours before carrying out the laminating of the polyimide film to a metallic foil, and carrying out a laminating to a metallic foil has been taken as a means to improve the stability of the rate of a dimensional change.
[0003]
[Problem(s) to be Solved by the Invention] However, in such a desiccation art, in order to dry a film in oven with a volume, it could not heat-treat continuously in Rhine, but the blemish was sufficient for the film just, dust may adhere, a wrinkling may enter and there were troubles, such as requiring long duration for drying the polyimide film of a long object to the inside. The laminating of the metallic foil is carried out with adhesives by making a polyimide film without such many defects into an original fabric, dimensional stability and an adhesive property are good, this invention offers the manufacture approach of the high substrate for polyimide system flexible printed circuits of a yield,

and carries out the laminating of the release agent with adhesives by making this polyimide film into an original fabric, and dimensional stability and its adhesive property are good, and it offers the manufacture approach of the high cover-lay film of a yield.
[0004]
[Means for Solving the Problem] this invention persons completed this invention, as a result of examining wholeheartedly the physical properties and pretreatment conditions of an original fabric film, in order to solve the above-mentioned technical problem. Namely, heat a polyimide film continuously at infrared radiation or a far-infrared heater all over Rhine, and this invention dries, as indicated to claim 1. Water content of this film Consider as 0.1 or less % of the weight, and thermosetting adhesive is applied to the one side or both sides. In the condition of having carried out the laminating of the metallic foil on it, and having removed the metallic foil of this laminate for the rate of a dimensional change of this film-metallic foil laminate with the measured value after heat treatment, for 150 degree-Cx 30 minutes It is the manufacture approach of the substrate for polyimide system flexible printed circuits characterized by making a longitudinal direction and the cross direction less than **0.05%. Moreover, heat a polyimide film continuously at infrared radiation or a far-infrared heater all over Rhine, and this invention dries, as indicated to claim 2. Water content of this film It considers as 0.1 or less % of the weight, and thermosetting adhesive is applied to the one side or both sides, and the laminating of the release agent is carried out on it. The rate of a dimensional change of this film-release agent laminate with the measured value after heat treatment for 150 degree-Cx 30 minutes It is the manufacture approach of the cover-lay film characterized by making a longitudinal direction and the cross direction less than **0.05%. And before these approaches heat said polyimide film and dry, they are the manufacture approaches of performing low-temperature plasma treatment by inorganic gas beforehand. This invention is explained further in full detail below.
[0005]
[Embodiment of the Invention]
(Substrate for flexible printed circuits) With a commercial item, it is good and the polyimide film used for this invention is thickness 12.5-125. mum, width of face 500-1016mm is common. Since a polyimide film tends to absorb moisture and it is manufactured by the heating condensation reaction by the casting method etc., the rate of a dimensional change of a commercial item is large, and the dispersion is also large for every film lot. Incidentally, the average of another rate of a dimensional change is shown in Table 1 in the thickness of a commercial item polyimide film. The rate of a dimensional change of a film is IPCFC 241 here. It applies to an approach correspondingly and is an original fabric film. It measures after heat treatment for 150 degree-Cx 30 minutes, and is a rate of a dimensional change to the dimension before heat treatment of a longitudinal direction and the cross direction.
[0006]
[Table 1]

フィルム厚さ	寸法変化率（×10⁻²%）	
（μm）	長手方向	幅方向
12．5	−10．8	−10．8
25．0	−10．2	−10．2
50．0	− 8．2	−11．0

（サンプル数N＝5の平均値）

[0007] Therefore, if a laminating is carried out to a metallic foil as it is, the rate of a dimensional change and dispersion of a laminate also tend to become large. So, in this invention, said technical problem was solved by drying the moisture which absorbed moisture to the polyimide film original fabric just before the laminating with infrared radiation or far infrared rays. That is, stoving of this film is carried out at infrared radiation or a far-infrared heater continuously [just before applying thermosetting adhesive to this film] all over Rhine, and it is the water content of a film 0-0.1 Weight % and after adjusting to 0 - 0.08% of the weight preferably, thermosetting adhesive is applied, the laminating of the metallic foil was carried out, and the rate of a dimensional change of a laminate was fallen and stabilized. Water content In the condition of exceeding 0.1 % of the weight, the film is still expanding, the rate of a dimensional change before and behind desiccation becomes large, and it is not desirable. The rate of a dimensional change of the laminate said here is IPCFC 241. It is what carried out dimension measurement after heat treatment for 150 degree-Cx 30 minutes about what removed the copper foil of the product sample of a laminate by etching according to the approach, and it is required for a longitudinal direction and the cross direction to make the rate of a dimensional change to the dimension before heat treatment less than **0.05%. Furthermore, it is desirable to make the rate of a dimensional change less than **0.03% to heat treatment before. If both directions exceed **0.05%, in case this rate of a dimensional change will carry out the laminating of the cover-lay film to this laminate, by dispersion in the dimension of a film, a hole location shifts, or it curls, workability worsens, un-arranging, such as doing damage to the circuit section at the time of punching of a flexible printed circuit board, arises, and it is not desirable.

[0008] When an example is given as the desiccation approach of the film original fabric at an infrared heater, there is the approach of irradiating infrared radiation and carrying out stoving to the polyimide film which it began to roll from a roll from the infrared heater installed in the vertical direction. Infrared radiation has the property which is absorbed by the matter and changed into heat, and in an infrared large field, especially a high polymer film can have absorption and can heat it efficiently. Although infrared radiation or a far-infrared heater may be what commercial type of thing, it is good to use the infrared radiation of 1x104 - 1x107 ** preferably as a wavelength field. For example, embedding heaters, such as a sheath heater which enclosed a nichrome wire and magnesia powder, and others in a quartz tube mold infrared heater, an R form (reflective electric bulb which contained the aluminum reflector) or a smooth S form (what attached electric bulb in metallic reflection bamboo hat) unit infrared lamp, and stainless steel tubing, or ceramics, the brass cast heater which embedded the nichrome wire at brass are mentioned.

[0009] Next, it is necessary to set up conditions, such as heater power, an irradiation

range, irradiation time, and infrared wavelength, the optimal corresponding to the film quality of the material and a metallic foil ingredient. although it depends for the power of a heater on the thickness, width of face, and line speed of a film -- 12.5 to 125 micrometer film thickness -- width of face the case of 508-620mm -- line speed 0.5 - 20 m/min -- 500-20kW comes out enough with 1000-10kW power (based on the volume of a film) preferably. moreover, an irradiation range -- 30 - 500 mm -- desirable -- 50 - 300 mm and irradiation time -- 5-120 A second is suitable. Heater skin temperature can irradiate 300-2500 degrees C and desirable infrared radiation sufficient within the limits of 500-1500 degrees C, and is the water content of a polyimide film. It can carry out to 0.1 or less % of the weight. Under the present circumstances, skin temperature of a polyimide film It is desirable to make it 150 - 350 **. As a far-infrared heater, although a wavelength field uses the thing of 2.5x105 - 1x107 **, other conditions apply to an infrared heater.

[0010] Moreover, before carrying out the infrared drying of the polyimide film, it is desirable to carry out low-temperature plasma treatment, to reform a film front face, and to heighten adhesive strength with thermosetting adhesive. Low-temperature plasma treatment puts a polyimide film into the low-temperature plasma treatment equipment which can be decompressed. A pressure as an ambient atmosphere of inorganic gas for the inside of equipment 0.001 - 10Torr, It is inter-electrode in the condition of having held to 0.01 - 1Torr preferably. Although plasma treatment of the front face is carried out continuously, generating the low-temperature plasma of inorganic gas and carrying out sequential migration of this film by impressing and carrying out glow discharge of a 0.1-10kV direct current or the alternating current Plasma treatment time amount is 0.1-100 in general. It is good to consider as a second. As inorganic gas, although inert gas, such as helium, neon, and an argon, or oxygen, a carbon monoxide, a carbon dioxide, ammonia, air, etc. are used, two or more sorts of these may be mixed not only in a kind.

[0011] After applying thermosetting adhesive to one side or both sides of the polyimide film dried at this infrared radiation or a far-infrared heater by a roll coater etc., carrying out evaporation removal of the solvent by 50 - 150 ** with a dryer and changing adhesives into the condition of semi-hardening, a laminated film is continuously manufactured by carrying out thermocompression bonding to a metallic foil by 60 to 120 degree C, and 1 - 10 kg/cm with the heated hot calender roll. This laminated film, adhesives are stiffened, and it considers as the substrate product for flexible printing. [80 to 200 degree C] [over dozens of 1- hours] [in a drier]

[0012] As heat-curing mold heatproof adhesives which stick a polyimide film and a metallic foil Bond strength is high and the thermal resistance which bears use of solder etc. is required. To this An epoxy resin, NBR-phenol system resin, phenol-butyral system resin, epoxy-NBR system resin, Epoxy-polyester system resin, epoxy-nylon system resin, epoxy-acrylic resin, acrylic resin, polyamide-epoxy-phenol system resin, polyimide system resin, silicone system resin, etc. are illustrated. The thickness of an adhesives layer has desirable 5-30 micrometers at the time of desiccation. Next, as a metallic foil, copper foil, aluminium foil, an iron foil, a nickel foil, etc. can be mentioned. Generally, as an object for printed circuits, copper foil is main and, as for the thickness of rolling and electrolytic copper foil, a 18-70-micrometer thing is used.

[0013] (Cover-lay film) It is easy to absorb moisture like the polyimide film which also uses for a flexible printed circuit board the polyimide film used for a cover-lay film, and

since the rate of a dimensional change is large, the rate of a dimensional change and dispersion of the cover-lay film which coated thermosetting adhesive also tend to become large. In this invention, said technical problem was solved by drying the moisture which absorbed moisture to the polyimide film original fabric just before the laminating with infrared radiation or far infrared rays. That is, stoving of this film is carried out at infrared radiation or a far-infrared heater continuously [just before applying thermosetting adhesive to this film] all over Rhine, and it is the water content of a film 0-0.1 The stability of the rate of a dimensional change of a cover-lay film was improved weight % and by adjusting to 0 - 0.08% of the weight preferably. The rate of a dimensional change of the cover-lay film said here is the above-mentioned IPCFC 241. It applies to an approach correspondingly. It is required to measure after heat treatment for 150 degree-Cx 30 minutes, and to make both the rates of a dimensional change to the dimension before heat treatment of a longitudinal direction and the cross direction less than **0.05%. It is good to make the rate of a dimensional change preferably less than **0.03% to heat treatment before. Water content In the condition of exceeding 0.1 % of the weight, the film is still expanding, the rate of a dimensional change before and behind desiccation becomes large, and it is not desirable. If this rate of a dimensional change exceeds **0.05% for both directions, in case a film will curl, workability will worsen and it will stick with the substrate for flexible printed circuits, a location gap arises.

[0014] The desiccation approach at an infrared heater is the same as the desiccation approach of the polyimide film in manufacture of the substrate for flexible printed circuits. After applying thermosetting adhesive to one side or both sides of the polyimide film dried at this infrared radiation or a far-infrared heater by a roll coater etc., carrying out evaporation removal of the solvent by 50 - 150 ** with a dryer and changing adhesives into the condition of semi-hardening, a cover-lay film is continuously manufactured by carrying out thermocompression bonding to a release agent by 60 to 120 degree C, and 1 - 10 kg/cm with the heated hot calender roll.

[0015] The same thing as the heat-curing mold heatproof adhesives which stick the polyimide film and metallic foil in manufacture of the substrate for flexible printed circuits as heat-curing mold heatproof adhesives with which a polyimide film is coated is mentioned. The thickness of an adhesives layer has desirable 5-30 micrometers at the time of desiccation.

[0016] Next, as a release agent, a release paper or mold-release characteristic films of polyolefine, such as a polyethylene film, PP film, a TPX film, polyester film with a silicone system release agent, polyethylene, and polypropylene, etc. are mentioned. [, such as film coat paper,]

[0017] Furthermore, also in a cover-lay film, in order to improve the adhesive property of a polyimide film, surface treatment, such as low-temperature plasma treatment by inorganic gas and corona discharge treatment, may be performed. Especially low-temperature plasma treatment is desirable. In this case, before infrared-heating desiccation processing, low-temperature plasma treatment continues in in-line one, and is performed. What is necessary is just to perform low-temperature plasma treatment on the same conditions as the low-temperature plasma treatment of the substrate for flexible printed circuits.

[0018] Just before the laminating of a polyimide film original fabric with an operation of this invention high [water content], and a metallic foil, Or just before applying

thermosetting adhesive to just before the laminating of a polyimide film and a release agent (i.e., this film) Stoving of this film is continuously carried out at infrared radiation or a far-infrared heater, and it is water content 0.1 After adjusting to below weight % and securing the dimensional stability of this film, Thermosetting adhesive is applied, the laminating of a metallic foil or the release agent is carried out, it falls and the rate of a dimensional change of a laminate or a cover-lay film is stabilized. Thus, the good flexible printed circuit board of workability can be manufactured with the sufficient dimensional stability which is both special feature by carrying out circuit printing, etching into the substrate for flexible printed circuits with sufficient dimensional stability, producing a circuit, and sticking a cover-lay film with the above-mentioned sufficient dimensional stability on this circuit side.

[0019]

[Example] Although an example and the example of a comparison are given to below and this invention is explained to it, this invention is not limited to these examples.

(Example 1) Continuation plasma treatment equipment performed low-temperature plasma treatment for APIKARU (a trade name, polyimide film by Kaneka Co., Ltd.) of 25 micrometers in thickness, and width-of-face 508 mm. Processing conditions are a degree of vacuum. 0.1Torr and oxygen flow rate 1.0l. / min It supplies and they are the applied voltage of 2kV, and a frequency. 30kW power was inputted by 110kHz. A plasma generator arranges four electrodes in the shape of a cylinder, meets the periphery of an electrode in the distance of 40mm of outsides of an electrode in a film, and is 50 m/min. It was made to move at a rate and processed.

[0020] next, desiccation of a film -- as an infrared heater -- a pipe heater (8 light business-affairs company make --) the capacity of 1kW, and pipe length The coat of the special metallic oxide has been carried out to 715mmx12mmphi and the sheath made from stainless steel, and the infrared radiation of the wavelength over 10-80 micrometers is obtained with sufficient balance. The upper and lower sides three each and 250mm It is from a film at spacing. It arranges to desiccation Rhine with a distance of 100mm, heater skin temperature is made into 600 **, and it is line speed 5 m/min. The film was poured continuously and infrared radiation was irradiated. Irradiation time was made into 12 seconds at this time.

[0021] It applied to the film dried through between heaters by the roll coater so that the thickness after drying epoxy-phenol system adhesives might be set to 18 micrometers, and it let it pass on the in-line dryer, the solvent was removed by 130 **, and adhesives were made into the semi-hardening condition. subsequently, 35-micrometer electrolytic-copper-foil JTC-35 (Japan Energy trade name) and a lamination roll (roll temperature 100 degrees C, pressure 2.0 kg/cm) -- thermocompression bonding -- the laminating was carried out and it rolled round in the shape of a roll. Next, the rolled-round middle article is reached in hot blast circuit system KYUA oven for 80 degree-Cx 3 hours. It cooled, after carrying out heat hardening in 160 degree-Cx 5 hours. The physical properties of the rate of a dimensional change and others of this product substrate were measured. The average of five sample numbers was shown in Table 2.

[0022]

[Table 2]

例	No	フィルム厚み μm	低温プラズマ処理	赤外線照射 距離 mm	赤外線照射 時間 sec	フィルム表面温度 ℃	含水率 wt%	寸法変化率 長手方向 %	寸法変化率 幅方向 %	引剥し強度 kg/cm	半田耐熱性 ℃	しわ	カール
実施例	1	25	有	100	12	250	0.03	-0.02	0.00	1.2	350	○	○
	2	25	有	80	12	280	0.05	-0.02	0.01	1.2	350	○	○
	3	25	有	300	50	200	0.06	-0.04	0.03	1.2	350	○	○
	4	25	有	200	60	250	0.03	-0.02	0.02	1.2	350	○	○
	5	25	有	150	20	260	0.05	-0.03	0.04	1.2	350	○	○
	6	25	有	50	5	250	0.05	-0.03	0.03	1.2	350	○	○
	7	12.5	有	100	12	300	0.02	-0.02	0.01	1.3	350	○	○
	8	50	有	100	30	300	0.04	-0.02	0.01	1.1	350	○	○
比較例	1	25	有	−	−	−	0.38	-0.07	0.05	1.0	350	○	△
	2	50	有	−	−	−	0.52	-0.06	0.05	1.0	350	○	△
	3	25	有	100	2.5	150	0.15	-0.07	0.05	1.1	350	○	△
	4	25	無	−	−	−	0.38	-0.18	0.20	0.8	350	○	×
	5	12.5	無	*−	−	−	0.03	-0.09	0.08	0.9	350	×	×
	6	25	無	*−	−	−	0.03	-0.08	0.08	0.8	350	×	×

(*ただし乾燥器中 110℃×5hrで乾燥)

[0023] The physical properties of a substrate film and a product laminate (the substrate for flexible printed circuits, cover-lay film) were measured by the following approach.
- Film water content [weight %]
The weight of a sample film and the weight after drying this film with the above-mentioned drier for 150 **x 5 hours were measured having used water content of the film when drying with a drier (oven made from KATO, and ROYAL RO 24) for 150 **x 5 hours as 0 % of the weight, and it asked for water content from the degree type. (IPCFC 241 Conformity)
Water content = {(weight after the weight-desiccation before desiccation) weight before /desiccation} x100[weight %]
- The rate of a dimensional change of a laminate [**%]
IPCFC 241 It applied correspondingly, etching removed the copper foil of a laminate, heat treatment for 150 **x 30 minutes was performed in the state of the film and the adhesives layer, and it asked for the rate of a dimensional change from the dimension before and behind heat treatment.
x100 {(before after [heat treatment]-heat treatment) before /heat treatment} [**%] [rate = of dimensional change]
(-%: Contraction, +%:elongation)
- The rate of a dimensional change of a cover-lay film [**%]
IPCFC 241 It applied correspondingly, the dimensional change of the longitudinal direction and the cross direction of a cover-lay film was measured, respectively, heat

treatment for 150 **x 30 minutes was performed, and it asked from each dimension before and behind heat treatment.
- Visual-inspection O : with the generating nothing of Siwa, and no curl.
x: Those of Siwa with generating, those with curl.
: Siwa and curl are a ** a little.
- Lengthen and remove and it is JIS in strength. C-6481 Semi- **.
- Solder thermal resistance JIS It is semi- ** to C-6481.
[0024] Except having considered as the monograph affair of example [of example 2 - example 8 table 2] 2 - example 8 publication, the infrared drying of the film was carried out like the example 1, adhesives were applied, it dried, the laminating was carried out to copper foil, and the substrate was produced. A physical-properties measurement result is written together to Table 2.
[0025] For the example of comparison 1 comparison, except having not carried out the infrared drying of the polyimide film which carried out plasma treatment, it processed completely like the example 1, the laminate was manufactured, and product physical properties were measured. A result is written together to Table 2.
[0026] It carried out on the same conditions as the example 1 of a comparison except having used that whose thickness of example of comparison 2 polyimide film is 50 micrometers. A result is written together to Table 2.
[0027] In the infrared exposure of example of comparison 3 film desiccation, only the-two upper and lower sides use a pipe heater, and it is irradiation time. It carried out on the same conditions as an example 1 except having considered as 2.5 seconds (line speed 6 m/min). A result is written together to Table 2.
[0028] It carried out on the same conditions as the example 1 of a comparison except not performing example of comparison 4 plasma treatment. A result is written together to Table 2.
[0029] It is about film desiccation among a drier (above oven made from KATO and ROYAL OVEAN RO 24) with 500m volume, without carrying out plasma treatment using a thing with a thickness [of example of comparison 5 polyimide film] of 12.5 micrometers. It carried out on the same conditions as the example 1 of a comparison except having considered as standing for 110 degree-Cx 5 hours. A result is written together to Table 2. In addition, the horizontal wrinkling had generated the dry polyimide film over about 50m from the volume heart side.
[0030] It is 1500m about film desiccation, without carrying out example of comparison 6 plasma treatment. It is among far-infrared oven (a Japanese electric heat instrumentation company product, an infrared furnace ceramic heater, 450Wx4) with the original fabric of a volume. It carried out on the same conditions as the example 1 of a comparison except having considered as standing for 110 degree-Cx 5 hours. A result is written together to Table 2. In addition, the horizontal wrinkling had generated the dry polyimide film over about 30m from the volume heart side.
[0031] Plasma treatment was carried out like example 9 example 1, it applied to one side of the film dried through between infrared heaters by the roll coater so that the thickness after drying epoxy-NBR system adhesives might be set to 30 micrometers, and it let it pass on the in-line dryer, the solvent was removed by 130 **, and adhesives were made into the semi-hardening condition. Subsequently, with a lamination roll (roll temperature 100 degrees C, pressure 2.0 kg/cm), the semi-hardening adhesive coated surface of this

film was made to carry out thermocompression bonding of the release paper with a silicone release agent, it rolled round in the shape of a roll, and the cover-lay film was produced. The rate of a dimensional change of this cover-lay film and other physical properties were measured. The average of five test portion numbers is shown in Table 3.

[0032]

[Table 3]

例	No	フィルム厚み μm	低温プラズマ処理	赤外線照射 距離 mm	赤外線照射 時間 sec	フィルム表面温度 ℃	含水率 wt%	寸法変化率 長手方向 %	寸法変化率 幅方向 %	引剥し強度 kg/cm	半田耐熱性 ℃	しわ	カール
	9	25	有	100	12	250	0.03	-0.03	0.02	1.2	350	○	○
	10	25	有	80	12	280	0.05	-0.02	0.03	1.2	350	○	○
実	11	25	有	300	50	200	0.06	-0.04	0.03	1.2	350	○	○
施	12	25	有	200	60	250	0.03	-0.03	0.00	1.2	350	○	○
例	13	25	有	150	20	260	0.05	-0.03	0.04	1.2	350	○	○
	14	25	有	50	5	250	0.05	-0.04	0.02	1.2	350	○	○
	15	12.5	有	100	12	300	0.02	-0.03	0.00	1.3	350	○	○
	16	50	有	100	30	300	0.04	-0.02	0.02	1.1	350	○	○
	7	25	有	—	—	—	0.38	-0.07	0.03	1.0	350	○	△
比	8	50	有	—	—	—	0.52	-0.08	0.07	1.0	350	○	△
較	9	25	有	100	2.5	150	0.15	-0.08	0.05	1.1	350	○	△
例	10	25	無	—	—	—	0.38	-0.22	0.20	0.9	350	○	×
	11	12.5	無	*—	—	—	0.03	-0.12	0.09	1.0	350	×	×

(*ただし乾燥器中 110℃×5hrで乾燥)

[0033] It carried out like the example 9 except having considered as the monograph affair of example [of example 10 - example 16 table 3] 10 - example 16 publication. A result is written together to Table 3.

[0034] It carried out on the same conditions as an example 9 except having not dried a polyimide film after plasma treatment for the example of comparison 7 comparison. A result is written together to Table 3.

[0035] It carried out on the same conditions as the example 7 of a comparison except having used that whose thickness of example of comparison 8 polyimide film is 50 micrometers. A result is written together to Table 3.

[0036] It is irradiation time when only the-two upper and lower sides use a pipe heater in the infrared exposure of example of comparison 9 film desiccation. It carried out on the same conditions as an example 9 except having considered as 2.5 seconds (line speed 6 m/min). A result is written together to Table 3.

[0037] It carried out on the same conditions as the example 7 of a comparison except not performing example of comparison 10 plasma treatment. A result is written together to Table 3.

[0038] Using that whose thickness of example of comparison 11 polyimide film is 12.5

micrometers, plasma treatment was not performed and polyimide film desiccation was performed on the same conditions as an example 9 except having considered as standing for 110 in drier (above oven made from KATO) **x 5 hours with the 500m volume. A result is written together to Table 3.

[0039]

[Effect of the Invention] According to this invention, since the dispersion has a small small rate of a dimensional change, the adhesive good substrate for flexible printed circuits and an adhesive cover-lay film can be manufactured, and etching at the time of printed circuit production, a cover-lay film laminating, and the dimensional accuracy in solder processing each process are maintained and a film is dried with in-line one good [dimensional stability], productivity and the yield also improve, and it has very high utility value on industry.

CLAIMS [JP,10-235784,A]

[Claim(s)]

[Claim 1] Heat a polyimide film continuously at infrared radiation or a far-infrared heater all over Rhine, and it dries. Water content of this film Consider as 0.1 or less % of the weight, and thermosetting adhesive is applied to the one side or both sides. In the condition of having carried out the laminating of the metallic foil on it, and having removed the metallic foil of this laminate for the rate of a dimensional change of this film-metallic foil laminate with the measured value after heat treatment, for 150 degree-Cx 30 minutes The manufacture approach of the substrate for polyimide system flexible printed circuits characterized by making a longitudinal direction and the cross direction less than **0.05%.

[Claim 2] The manufacture approach of the substrate for polyimide system flexible printed circuits according to claim 1 of performing low-temperature plasma treatment by inorganic gas beforehand before heating said polyimide film and drying.

[Claim 3] A polyimide film is continuously heat at infrared radiation or a far-infrared heater all over Rhine, and it dries, and is the water content of this film. The manufacture approach of the cover lay film characterize by consider as 0.1 or less % of the weight, apply thermosetting adhesive to the one side or both sides, carry out the laminating of the release agent on it, and a longitudinal direction and the cross direction make the rate of a dimensional change of this film-release agent laminate less than **0.05% with the measured value after heat treatment for 150 degree Cx 30 minutes.

[Claim 4] The manufacture approach of a cover-lay film according to claim 3 of performing low-temperature plasma treatment by inorganic gas beforehand before heating said polyimide film and drying.